

# **CASA IMMUNIZATION COVERAGE SURVEY**

**2000**



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## **CASA 2000**

### **Executive Summary**

Coverage rates of children two years of age in 2000 were assessed at local health departments to see whether Kansas was reaching the 90% coverage goals set by the Centers for Disease Control and Prevention (CDC) and the National Childhood Immunization Initiative (CII). Immunization coverage rates were measured for 4 doses of diphtheria, tetanus, and pertussis (DTP4), 3 doses of polio (Polio3), 1 dose of measles, mumps, and rubella (MMR1), 3 doses of *H. influenzae* (Hib3), 3 doses of hepatitis B (HepB3) and the combination of DTP4, Polio3, MMR1, Hib3, and HepB3 (4-3-1-3-3). One-year old children were also included in this assessment in order to identify non-immunized and under immunized children sooner. Evaluation of coverage rates for the one-year old children in 2000 included the following: 3 doses of diphtheria, tetanus, and pertussis (DTP3), 2 doses of polio (Polio 2), 2 doses of *H. influenzae* (Hib2), 2 doses of hepatitis B (HepB2), and the combination of DTP3, Polio2, Hib2, and HepB2 (3-2-2-2).

For the children in the two-year old cohort, the number of local health departments achieving the 90% coverage goal has increased for all single vaccines and 4-3-1-3-3 combination compared to 1999. Despite the increases, only 33 counties achieved 90% coverage rates for the 4-3-1-3-3 combination. The statewide mean coverage rates for all single vaccines and 4-3-1-3-3 combination have increased compared to the mean coverage rates from the previous year. Coverage rates for Polio3, MMR1, Hib3, and HepB3 have surpassed the goal of 90% coverage. DTP4 and the 4-3-1-3-3 combination had mean coverage rates of 80%.

For the one-year olds, the statewide mean coverage rates have increased for all the single vaccines and the 3-2-2-2 combination. For the Polio2, Hib2, and HepB2, the coverage rates are at least 90% and for DTP2 and 3-2-2-2 combination coverage rates are at least 85%.

Coverage rates were also evaluated at the interim time points. In both cohorts at 3 months of age, at least 80% of the children were adequately immunized. However, coverage rates decrease by at least 30 percentage points by 7 months of age. The coverage rates at 12 months of age have increased and are at levels similar to those at 3 months of age. However in the two-year old cohort, coverage rates decrease again at 16 months of age by 25 percentage points and then begin to rise again until 24 months of age where more than 80% of the children are fully immunized.

Children who start their immunization series on time at 3 months of age were compared to children who start the series late. In the two-year old cohort, children who started on time were 1.7 times more likely to complete the series on time at 24 months of age than those who started late. In the one-year old cohort, children who started on time were 2.1 times more likely to complete the series on time at 12 months of age than those who started late.

## BACKGROUND

Immunization of children against nine diseases has proven effective in reducing the morbidity and mortality of those diseases. For this reason, the Centers for Disease Control and Prevention (CDC) and the National Childhood Immunization Initiative (CII) have set goals for the year 2000 of 90% immunization coverage for all children by their second birthday of the following single antigens and a combination of all vaccines: 4 doses of diphtheria, pertussis, and tetanus vaccine (DTP4); three doses of polio vaccine (Polio3); one dose of measles, mumps, and rubella vaccine (MMR1); three doses of *Haemophilus influenzae* type b vaccine (Hib3); and three doses of hepatitis B vaccine (HepB3). The complete set is referred to as the 4-3-1-3-3 combination of vaccines.

Even though no immunization goals for one-year old children have been established, children are expected to have received the following immunizations by their first birthday: 3 doses of diphtheria, pertussis, and tetanus vaccine (DTP3); two doses of polio vaccine (Polio2); two doses of *Haemophilus influenzae* type b vaccine (Hib2); and two doses of hepatitis B vaccine (HepB2). The complete set is referred to as the 3-2-2-2 combination vaccine. One-year old children were included in this assessment in order to identify non-immunized and under immunized children sooner and increase the possibility of these children receiving all immunizations by their second birthday.

The field staff at the Immunization Program from Kansas Department of Health and Environment assessed immunization levels of both two-year old, and one-year old children at all local health departments. The assessments included in this study were conducted between January 1, and December 31, 2000.

## METHODS

Using the Clinic Assessment Software Application (CASA) designed by the CDC, immunization coverage rates were evaluated at all local health departments for children either one-year old or two-years old. The one-year-old cohort included all children between the ages of 12 and 23 months and the two-year old cohort included all children between the ages of 24 and 35 months based on the date of assessment. Children were excluded if they were documented as having moved out of the area or going elsewhere for health care (MOGE). For local health departments with 100 or fewer eligible records all records were examined. For local health departments with a larger number of records, a listing of eligible children was generated and then a random sample of at least 100 records was chosen and examined.

At the local health departments, coverage rates for DTP4, Polio3m MMR1, Hib3, HepB3 and the 4-3-1-3-3 combination were examined for the two-year old cohort. For the one-year-old cohort, coverage rates for DTP3, Polio2, Hib2, HepB2, and the 3-2-2-2 combination were evaluated at each local health department. Results and explanations of the immunization assessment were given to each local health department. The local health

departments were also provided with a list of all children from the sample that were not up-to-date for immunizations or were considered as a missed opportunity in order to help the health departments identify the children who need to still needed at least one vaccine.

Following an assessment at the local health department, immunization field staff discussed potential areas for improvement in management of the immunization clinic. Procedural changes such as changes in personnel, record keeping, tracking patients, and reminder/recall system were evaluated in order to better assess the changes on coverage rates. Factors that affected changes on coverage rates included implementation of computerized tracking system, new recall/reminder system, method of classifying children who had moved or gone elsewhere (MOGE), and change of immunization personnel. Each health department received an overall review of their immunization coverage rates with suggestions for increasing coverage rates.

Additional analysis using Epi Info 6.01 was performed on the aggregate of health departments. The percentage of local health departments achieving the 90% immunization coverage goal was examined for the two-year-old cohort. These results were compared to immunization rates for 1999 in order to determine increases or decreases in coverage rates.

Data from all health departments was combined and analyzed for mean, median, and range for single vaccines and combinations. Also the percent of children up-to-date for immunization at interim months of age were computed for each cohort.<sup>1</sup> For both cohorts, the interim months of age used were 3, 5, 7, 9 and 12 and the additional months of 16, 19, 21 and 24 were examined for the two-year old cohort. The interim points of 3 and 24 months of age were used to assess the number of children that started their immunization series either on time or late and the number that finished on time or late for the two-year old cohort. Children who had received all necessary immunizations by the appropriate age were defined as on time and those who were missing at least one immunization were defined as late. The children late at 24 months were further examined to determine how many more immunizations they needed in order to be up-to-date. For the one-year-old cohort, the interim points 3 and 12 months were used instead.

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<sup>1</sup>Statewide rates of immunization coverage were calculated by combining all children in the samples obtained from all counties. Each county's sample is obtained independently from all other counties' samples, and each sample represents a proportion of children which is different from county to county. Statewide rates calculated in this way may be inaccurate, and may not represent the rate that would be found if one probability sample was selected for the whole state, or if each county sample received an appropriate weight during the analysis. The only purpose of the calculation presented in this document is to allow comparisons at different ages, not to make inference on the true statewide rate for any age groups.

## RESULTS

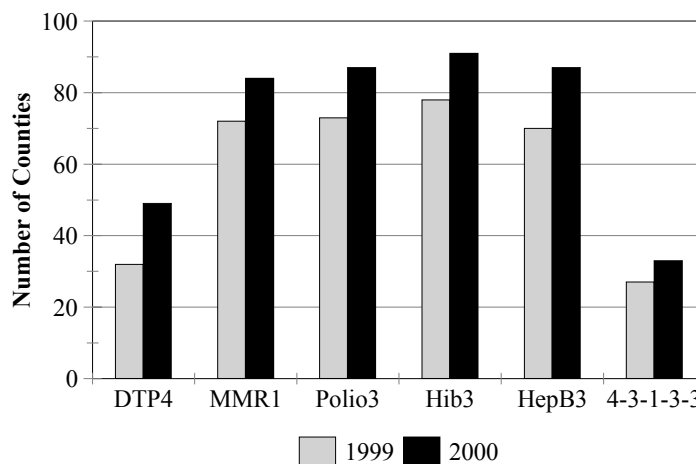
For the two-year cohort, 8128 records were reviewed with a range of 8 to 1788 records from 104 individual counties. The mean number of records examined for the two-year old cohort was 78 with a median of 58.5 records. For the one-year old cohort, 8443 records were reviewed with a range of 5 to 2655 records from 103 counties. In the one-year old cohort, a mean of 82 records and median of 52 records were examined. Data was missing for Montgomery County in the two-year old cohort and for Montgomery and Franklin Counties were missing for the one-year old cohort.

### TWO-YEAR OLD COHORT

#### *Counties Achieving the 90% Goal*

The immunization coverage rate goal for the year 2000 was 90% or better for single vaccines and for the combination of vaccines. The number of local health departments achieving 90% or better coverage increased for all single vaccines and the 4-3-1-3-3 combination compared to the 1999 CASA report (Figure 1). The greatest increase in the number of counties achieving 90% or better was for DTP4 and HepB3 which had an increase of 17 counties each. Despite an increase in for the 4-3-1-3-3 combination, only 33 counties have immunization coverage rates better than 90% for the full recommended series.

**Figure 1:** Number of County Health Departments in Kansas Achieving 90% Immunization Coverage for Single Vaccines in the Two-Year Old Cohort for CASA 1999 and 2000.



*Statewide Mean, Median and Range of Immunization Rates for Single and Combination Antigens*

In the two-year old cohort, the statewide mean coverage rates for all single vaccines and combination have increased from the 1999 CASA report. The mean coverage rates exceeded the 90% coverage goal for Polio3, MMR1, Hib3, and HepB3. For DTP4 and 4-3-1-3-3 combination, the coverage rate was at least 84%. Immunization coverage rates have increased from 79.2% to 84.4% for the 4-3-1-3-3 combination (Table 1). The median, or value that half of the counties meet or exceed, for all single vaccines and the 4-3-1-3-3 combination have increased compared to 1999 CASA. A decrease of variability among local health departments was seen in the narrowing of range of immunization coverage rates. The 4-3-1-3-3 combination with a range of 58 percentage points had the greatest range.

**Table 1:** Immunization Coverage Mean, Median, and Range for Two-Year Old Cohort at County Health Departments in Kansas for CASA 1999 and 2000.

ANTIGEN	2000			1999		
	Mean	Median	Range	Mean	Median	Range
<b>DTP4</b>	87.6%	89.2%	49.0-100%	82.9%	84.0%	33.3-100%
<b>Polio3</b>	93.2%	95.1%	68.0-100%	92.2%	94.4%	59.0-100%
<b>MMR1</b>	94.3%	96.3%	62.1-100%	91.7%	93.9%	52.0-100%
<b>Hib3</b>	95.0%	96.0%	76.8-100%	92.6%	94.4%	58.0-100%
<b>HepB3</b>	94.6%	96.3%	62.7-100%	92.0%	94.1%	51.0-100%
<b>4-3-1-3-3</b>	84.4%	86.2%	42.0-100%	79.2%	80.0%	27.0-100%

Mean immunization coverage rates were compared to the coverage rates from the 1999 CASA report to determine if any statistically significant changes had been made. Fifty-two counties had statistically significant increases in the 4-3-1-3-3 combination while 23 counties had a statistically significant decrease. The range of change of immunization coverage rates varied greatly with the widest range of change among the 4-3-1-3-3 combination with a range of 80.1 percentage points.

**Table 2:** Range of Change of Immunization Rates at Local Health Departments in Kansas from 1999 to 2000.

Vaccine	Range
<b>DTP4</b>	-15.7-53.7%
<b>Polio3</b>	-16.2-40.2%
<b>MMR1</b>	-27.7-31.2%
<b>Hib3</b>	-9.5-31.2%
<b>HepB3</b>	-26.3-42.1%
<b>4:3:1:3:3</b>	-26.0-54.1%

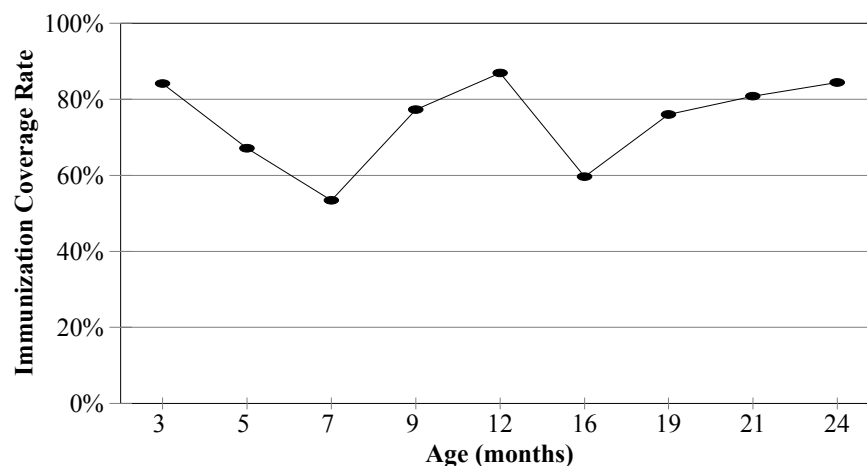
*Mean Immunization Rates at Interim Time Points*

Mean immunization coverage rates were examined at interim month time points. Table 3 lists the immunizations needed at each time interval. At 3 months of age, the mean immunization coverage rate was 84.1% (Figure 3). By seven months of age, immunization coverage rate dropped by almost 30 percentage points. Then at 12 months of age, immunization rate returned to similar coverage levels as 3 month of age. However, the immunization rate decreased by 25 percentage points at 16 months of age. At 24 months of age, mean immunization rate finally reached the same coverage rate as at 3 months of age

**Table 3:** Required Vaccines at Each Time Point and Combined Immunization Coverage Rates in Kansas for 1999 and 2000.

AGE	ANTIGEN	2000	1999
3 months	<b>DTP1, Polio1, Hib1, HepB1</b>	84.1%	82.3%
5 months	<b>DTP2, Polio2, Hib2, HepB2</b>	67.1%	64.4%
7 months	<b>DTP3, Polio2, Hib2, HepB2</b>	53.4%	51.0%
9 months	DTP3, Polio2, Hib2, HepB2	77.3%	75.1%
12 months	DTP3, Polio2, Hib2, HepB2	86.9%	84.0%
16 months	<b>DTP4, Polio3, Hib3, HepB3, MMR1</b>	59.6%	55.8%
19 months	DTP4, Polio3, Hib3, HepB3, MMR1	76.0%	70.7%
21 months	DTP4, Polio3, Hib3, HepB3, MMR1	80.8%	76.0%
24 months	DTP4, Polio3, Hib3, HepB3, MMR1	84.4%	79.8%

**Figure 3:** Mean Immunization Coverage Rates for Two-Year Old Cohort in Kansas at Time Intervals for 2000.

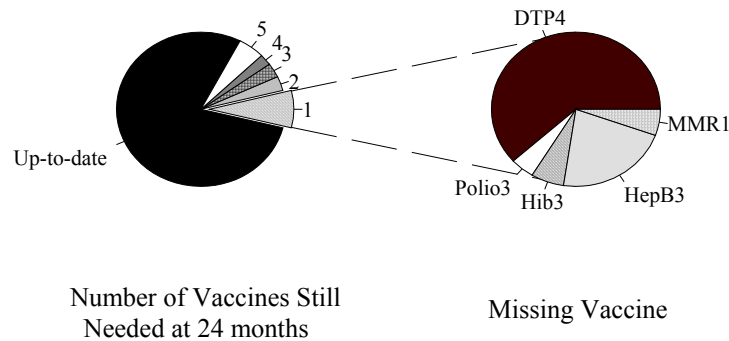


The likelihood of being up-to-date for all immunizations by 24 months of age depending on the up-to-date status at 3 months of age was also examined. At three months of age, 6600 children were up-to-date for DTP1, Polio1, Hib1, and HepB1. Of those children who started on time at 3 months, 71% (5671 children) had completed all necessary immunizations (DTP4, Polio3, Hib3, HepB3, and MMR1) on time by 24 months of age. However, only 42% (642) of the children who were late at 3 months of age were able to complete all immunizations by 24 months of age. ***This means that children who start on time are 1.7 times more likely to complete the series on time by 24 months of age compared to those children who do not begin the series on time.***

At 24 months of age, 1725 (21%) of all two-year olds were not up-to-date. Of those children, 616 only needed one more immunization in order to be up-to-date. If those children had received the missing immunization at 24 months of age, the statewide immunization coverage rate for the 4-3-1-3-3 combination would have increased from 84% to 93%. Of those children needing one immunization, almost two-thirds needed DTP4 in order to be up-to-date.



**Figure 4:** Number and type of immunization needed in order to be up-to-date at 24 months of age.



### One-Year Old Cohort

#### *Mean, Median, and Range of Statewide Immunization Rates for Single Vaccines and Combination*

Even though no immunization coverage goals have been established by either KDHE or CII, coverage rates for the one-year old cohort were examined. Mean coverage rates exceeded 90% for Polio2, Hib2, and HepB2. For DTP3 and the 3-2-2-2 combination, immunization rates exceed 85%. Compared to the one-year old cohort in the 1999 CASA report, coverage rates have increased for all single vaccines and the combination. Compared to the 1999 CASA Report, the median coverage rates have increased for all single vaccines and the combination. Despite the increases in coverage rates for both the mean and median, the range of coverage rates widened. The greatest variability was among DTP3 vaccine and the 3-2-2-2 combination, both which had a range greater than 44 percentage points.

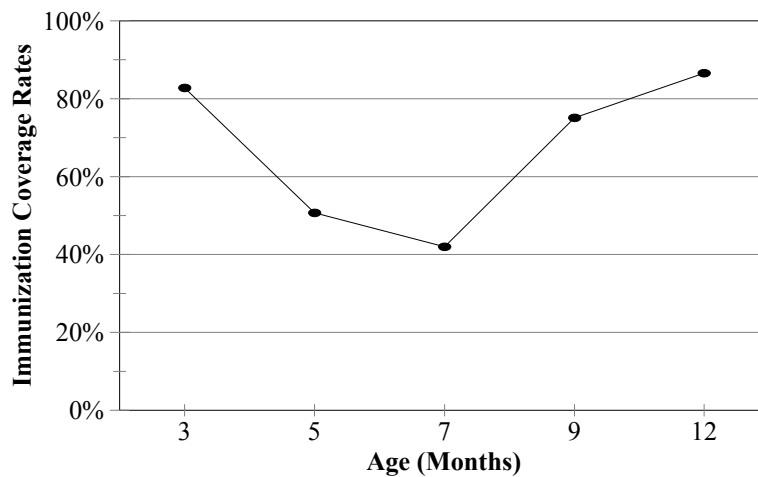
**Table 4:** Immunization Coverage Mean, Median, and Range for One-Year Old Cohort at County Health Departments in Kansas for CASA 1999 and 2000.

ANTIGEN	2000			1999		
	Mean	Median	Range	Mean	Median	Range
<b>DTP3</b>	86.6%	88.9%	56.4-100%	85.9%	86.9%	67.4-100%
<b>Polio2</b>	94.7%	96.0%	74.5-100%	93.9%	95.4%	83.7-100%
<b>Hib2</b>	94.1%	96.0%	76.4-100%	93.6%	95.0%	80.9-100%
<b>HepB2</b>	95.6%	97.0%	75.4-100%	95.0%	96.7%	80.0-100%
<b>3-2-2-2</b>	85.2%	87.5%	56.4-100%	83.4%	85.5%	66.0-100%

### *Mean Immunization Rates at Interim Time Points*

Like the two-year old cohort, the one-year old immunization coverage levels were assessed at interim months. At 3 months of age, 82.8% of the children were fully immunized (Figure 5). However, the mean immunization coverage rates decreased by almost half at 7 months of age where only 42% of the children were fully immunized. The coverage rates at 12 months of age returned to the levels similar to those at 3 months of age.

**Figure 5:** Mean Immunization Coverage Rates for One-Year Old Cohort at Time Intervals for County Health Departments in Kansas, 2000.



At 3 months of age, 6774 children had all the recommended immunizations for their age. Of those children who were up-to-date at 3 months of age, 72.6% (6127) had completed the recommended immunizations at 12 months of age. Of those children who were not up-to-date at 3 months of age only 38.8% (664) were up-to-date at 12 months of age.

***Therefore children who are up-to-date at 3 months of age are 2.1 times more likely to be up-to-date at 12 months of age compared to the children who are not up-to-date at 3 months of age.***

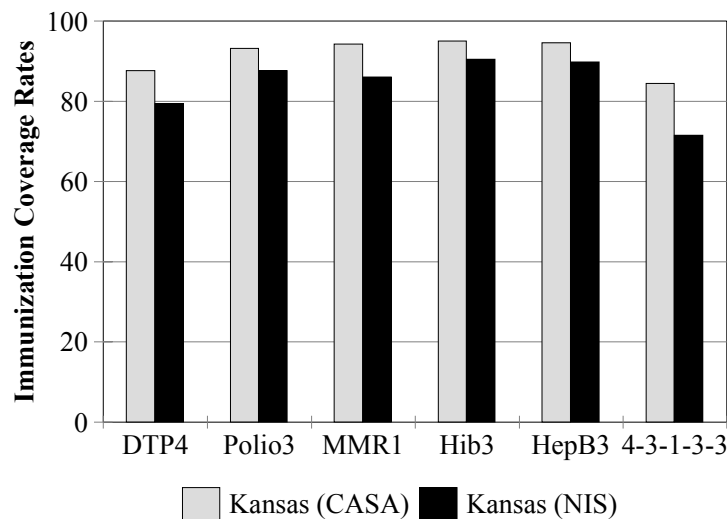
## **CONCLUSION**

Overall, the number of counties with at least 90% coverage in the two-year old cohort has increased in 2000 compared to the previous year for all single antigens and combinations. Nevertheless, only 33 counties have 90% or greater coverage for the 4-3-1-3-3 combination. The fourth DTP was usually the vaccine most likely missing in the 4-3-1-3-3 series.

In both age cohorts, mean coverage rates have increased since 1999. For the two-year old cohort, the overall coverage rates for Polio3, MMR1, Hib3, and HepB3 have exceeded 90%. However, for DTP4 and the combination coverage rates have only exceeded 80%. In the one-year old cohort, immunization coverage rates for all single antigens and the combination of vaccines increased. Immunization rates exceeded 90% for Polio3, Hib2, and HepB3 and exceeded 85% for DTP3 and the 3-2-2-2 combination.

Even though this study was not population based the two-year old cohort results can be compared to the 2000 National Immunization Survey (NIS) results for Kansas which refers to a similar time period as in this survey. Data for NIS was collected by the Centers for Disease Control and Prevention (CDC) through a telephone survey of randomly selected households. For accuracy, the healthcare providers (family physicians, pediatricians, etc.) of the children included in the survey were contacted by mail. NIS estimates were calculated using both household and provider data. Even though the 2000 CASA coverage rates are greater than the 2000 NIS Kansas coverage rates, the only differences in rates that are statistically significant are for Polio3, Hib3 and HepB3 (Figure 6).

**Figure 6:** Comparison of Immunization Coverage Rates in two-years between 2000 CASA and 2000 NIS Kansas.



For the two-year old cohort, coverage rates at 7 months of age decrease by 13 percentage points compared to the coverage rates at 5 months of age. Since **DTP3** is the only additional vaccine that is administered at 7 months of age, one possible explanation for the decrease is that a visit to the health department is postponed until later. Children who receive **DTP3** late may not be eligible for **DTP4** upon the next visit to the health

department for immunization of Polio3, Hib3, HepB3, and MMR1 since a minimum of 6 months is required between doses of DTP3 and DTP4. This means that children must make a separate visit to receive DTP4 and be up-to-date for all immunizations.

Children who receive their immunizations on time at 3 months are 1.7 times more likely to complete the 4-3-1-3-3 series by 24 months compared to the children who start late at 3 months. Using the reminder/recall option in the CASA program could decrease the number of children receiving vaccines late and as a result would increase the number of children up-to-date at 24 months of age.

This study had several limitations. The first was that this is not a population based study. This study only included children who attended a local health department for at least one of their immunizations and did not include children who attended for any other reason which might have resulted in an overestimation of coverage rates. On the other hand, an underestimation of coverage rates was also possible if immunization records fail to identify children who have moved or gone elsewhere (MOGE) for immunizations. Immunization records may have been inaccurate as a result of the county health departments using different forms of record keeping.

Despite the limitations, this survey served as an effective tool for assessing immunization coverage rates both at the state level and at the county level. When assessing the county health departments, the CASA was a helpful tool in swiftly identifying problem area and under immunized children. For these reasons, the assessment will be repeated again next year.